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By LEONARD P. SCHULTZ

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REVIEW OF SOUTH AMERICAN FRESHWATER ANGELFISHES—GENUS PTEROPHYLLUM

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The illustration of the new *Plataxoides leopoldi* Gosse (1963, Inst. Roy. Sci. Nat. Belgique Bull., vol. 39, no. 35, pp. 4–6, pl. 1, fig. 2) so closely resembled the illustration of *Plataxoides dumerilii* Castelnau (1855, Animaux nouveaux ou rares . . . d' Amérique du Sud, p. 21, pl. 11, fig. 3) that I decided to review the taxonomic status of all the nominal species of *Pterophyllum*. I shall attempt (1) to clarify the nomenclatural validity of the generic names *Pterophyllum* and *Plataxoides*, (2) to review the species complexes of *Pterophyllum scalare* (=*P. eimekei*) and *Plataxoides dumerilii* (=*P. leopoldi*,), and (3) to discuss the relationship between *Pterophyllum altum* Pellegrin and *P. scalare* (Lichtenstein).

I have studied all nonaquarium specimens of *Pterophyllum* available in the following museums: British Museum of Natural History (BMNH); California Academy of Sciences (CAS); Chicago Natural History Museum (CNHM); Museum of Comparative Zoology, Harvard (MCZ); Museum National Histoire Naturelle, Paris (MNHN); Institut Royal des Sciences Naturelles de Belgique, Bruxelles (IRSNB); Stanford University (SU); U.S. National Museum (USNM). To the authorities of the above institutions, I wish to express my gratitude for their help and other courtesies.

221–518—67——2

In the "Tropical Fish Hobbyist" (1953, vol. 1, no. 5, pp. 5–7, 20) I attempted to distinguish three species of aquarium-bred *Pterophyllum*. Since then I have studied specimens collected from their natural habitat, the syntypes of *Pterophyllum altum* Pellegrin, a syntype of *P. eimekei* Ahl, 27 paratypes of *Plataxoides leopoldi* Gosse, and the holotype of *P. dumerilii* Castelnau.

In my 1953 study I recognized *Pterophyllum scalare*, *P. eimekei*, and *P. altum* as valid species; however, with additional material my conclusions have changed and in this review I now recognize as valid *P. scalare*, *P. altum*, and *P. dumerilii*. *P. eimekei* is a synonym of *P. scalare*.

In the synonomy for each species I have recorded only the most pertinent references, omitting those related to aquaria.

I have attempted to record each locality from which *Pterophyllum* has been reported by latitude and longitude as found in "The Times Atlas of the World," 1957, vol. 5 ("The Americas"); "U.S. Board of Geographic Names Gazetteer," no. 56 ("Venezuela") and no. 71 ("Brazil"); Eigenmann's "The American Characidae," 1917, pt. 1, pl. 1; and Eigenmann and Allen's "Fishes of Western South America," 1942, pp. 67–81. Since I was unable to find a few localities, specimens from such places are not included in the distributional map for the species (pl. 1). Some of the other records are so unspecific in locality, e.g., "Rio Orinoco," that these cannot be plotted on the map. I have studied the routes followed by the collectors; the latitude and longitude used represents the best estimate for the information available.

The specific localities from which specimens of *Pterophyllum* have been collected are as follows:

locality	*longitude*	*latitude*
Ambyiacu, Río, Peru	3°10′ S	73°13′ W
Araguaia, Rio, near Aruana, Brazil	14°54′ S	51°05′ W
Atabapo, Río, Colombia	4°03′ N	67°45′ W
Belém [=Pará], Brazil	1°30′ S	48°55′ W
Cacaul or Cacauoal [=Cacoal], Brazil	1°59′ S	46°13′ W
Cashiboya, Lago above Contamana, Peru	7°19′ S	75°04′ W
Casiquiare, Río, Venezuela	2°01′ N	67°07′ W
Coary, Brazil	4°08′ S	63°07′ W
Crab Falls, British Guiana	5°17′ N	58°59′ W
Cupai [probably Rio Cupari], Brazil	3°04′ S	55°25′ W
Demerara or Georgetown, British Guiana	6°46′ N	58°10′ W
Iquitos, Peru	3°51′ S	73°13′ W
Jutahy, Brazil	3° S	66°57′ W
Manacapurú, Brazil	3°18′ S	60°37′ W
Manacapurú, Lago, Brazil	3°10′ S	61°30′ W
Manaus, Brazil	3°06′ S	60°00′ W
Marajó I, in Amazon, Brazil	1°45′ S	49° W
Maximo, Lago, Brazil	(?)	(?)
Monte Alegre, Brazil	2°01′ S	54°04′ W

locality	*longitude*	*latitude*
Nazareth, Brazil	1°13′ N	67°51′ W [probably]
Óbidos, Brazil	1°52′ S	55°30′ W
Pacaya, Río [see Yarinacocha]		
Pévas [=Pébas] Caño, Peru	3°10′ S	71°46′ W
Pôrto Alegre, Brazil	4°23′ S	52°45′ W
Pôrto do Móz, Brazil	1°45′ S	52°10′ W
Pôrto Negro [probably near Manaus], Brazil		
Purus, Río, Brazil	3°42′ S	61°28′ W
Rockstone, British Guiana	6°00′ N	58°30′ W
Rupununi River, British Guiana	3°55′ N	59°06′ W
Santarém, Brazil	2°26′ S	54°41′ W
Solimões, Rio, at Manacapurú, Brazil	3°18′ S	60°37′ W
Tabatinga, near Leticia, Brazil	4°14′ S	69°44′ W
Tefé [=Teffé], Rio, Brazil	3°24′ S	64°45′ W
Tonantins, Brazil	2°46′ S	67°45′ W
Uerandubа, Brazil	(?)	(?)
Urubu Rio, Brazil	2°55′ S	58°25′ W
Villa Bella [Rio Ramos], Brazil	2°36′ S	56°39′ W
Xingu, Rio [Pôrto Alegre], Brazil	4°23′ S	52°45′ W
Yarinacocha [Río Pacaya], Peru	5°10′ S	74° W

Pterophyllum Heckel

Pterophyllum Heckel, 1840, Ann. Wien. Mus., vol. 2, no. 12, p. 334 [type species: *P. scalare* Heckel=*Platax scalaris* Cuvier and Valenciennes].—Ahl, 1928, Zool. Anz., vol. 76, p. 252 [revision of 3 species].

Plataxoides Castelnau, 1855, Animaux nouveaux ou rares . . . de l'Amerique du Sud . . . , p. 21, pl. 11, fig. 3 [type species: *P. dumerilii* Castelnau].

TABLE 1.—*Number of vertebrae in* Pterophyllum

Species and localities	Abdominal			Caudal					Total				
	12	13	14	14	15	16	17	18	27	28	29	30	31
dumerilii													
British Guiana		1			1					1			
Rio Negro-Amazon		2	1	1	2					2			
Rio Negro, types of *leopoldi*	5	21		7	16	3			10	15	1		
Belém and Marajó Island	1						1				1		
altum													
Upper Orinoco		2					2					2	
scalare													
British Guiana		26		1	8	13	4		1	8	13	4	
Middle and lower Amazon		13				6	6	1			6	6	1
Belém and Marajó Island		7					7					7	
Peruvian Amazon		7			2	4	1			2	4	1	

The validity of the generic name *Pterophyllum* Heckel, long in use by ichthyologists and aquarists, needs to be clarified because Gosse (1963, p. 4) used the generic name *Plataxoides* Castelnau instead of *Pterophyllum*. Gosse (loc. cit.) and Whitley (1951, Proc. Roy. Zool.

Soc. New South Wales, p. 68) were in error in considering that *Pterophyllum* Heckel is not available as a generic name with the type species *Pterophyllum scalare* Heckel (=*Zeus scalaris* Lichtenstein). Myers (1940, Stanford Ichthy. Bull., vol. 2, no. 1, p. 36) pointed out that Neave (1940, Nomenclator zoologicus, vol. 3, p. 1028) was in error in the following statement: "*Pteropyhllum* (pro-ll*a*, Kirby 1825), Harris 1833, in Hitchcock, Rept. Geol. Min. Bot. Zool. Massach., 582-Orth." I have checked Harris (1833, 1835, Rep. Geol. Mineral. Bot. Zool. Massachusetts) and can verify Myers' observation that Harris consistently used *Pterophylla*, leaving *Pterophyllum* available.

Pterophyllum dumerilii (Castelnau)

PLATE 2

Plataxoides dumerilii Castelnau, 1855, Animaux nouveaux ou rares . . . de l'Amérique du Sud . . . , p. 21, pl. 11, fig. 3 [Pará=Belém].

Plataxoides leopoldi Gosse, 1963, Inst. Roy. Sci. Nat. Belgique Bull., vol. 39, no. 35, p. 4, pl. 1, fig. 2 [mouth of Rio Solimões, about 90 km above Manacapurú].

Specimens studied (see page 2 for more precise locality): BMNH 1902–11–4–10–12, Marajó, 3 (27 to 40 mm); BMNH 1902–2–11–4–9, Tonantins, 1 (41 mm); MCZ (out of 14992), Tefé, 2 (33 and 37mm); CNHM (out of 15254); Santarém, 1 (40 mm); CNHM 53846 Rupununi River, 2 (33 and 54 mm); CNHM (out of 54370), Santarém, 1 (37 mm.); USNM 167772, Rupununi River, 1 (40 mm.); USNM 198177, Rio Urubu, 1 (45 mm.); USNM 198178, Rio Purús, 2 (29 and 31 mm.); IRSNB 460, Rio Solimões. 90 km above Manacapurú, 27 paratypes of *P. leopoldi*, (34 to 61 mm); MNHN A 254, Pará, Brazil, holotype of *P. dumerilii* (49 mm); MNHN 221–61–3–7, Cacaual, 1 (37 mm); MNHN 221–61–3–6, Caldron, 2 (42 and 51 mm).

I examined the holotype of *Plataxoides dumerilii* Castelnau at the Museum National Histoire Naturelle, Paris, and found that Castelnau's illustration (1855, pl. 11) is in error. In his illustration, a black spot is shown behind the prominent black vertical bar that extends from the middle of the dorsal fin across body to the middle of the anal fin, whereas in the holotype this spot now shows as a trace in front of that dark bar, not behind it. Also, the dark vertical bars anteriorly on the illustration are incorrectly portrayed. On the holotype a short bar extends from the spiny dorsal origin ventrally to the lateral line, another short bar occurs halfway between the eye and the spiny dorsal origin; there is also a dorsoventral bar through the eye and across the cheek. These bars are prominent in well-preserved specimens and their positions differ notably from those of *Pterophyllum scalare* and *P. altum*. On the latter two species, the black bar through the eye extends dorso-posteriorly to the origin

of the spiny dorsal fin, replacing the two middle predorsal vertical bars on *P. dumerilii*. Thus, on the basis of coloration *P. dumerilii* can always be distinguished from *P. scalare* and *P. altum*. The number of vertebrae averages slightly fewer in *P. dumerilii* than in the other two species (table 1) and there are also slightly fewer soft dorsal and soft anal rays and fewer oblique scale rows (from rear of head to midbase of caudal fin) (table 2) than in *P. scalare* and

TABLE 2.—*Counts recorded for* Pterophyllum dumerilii

Localities	Dorsal fin rays										Pectoral fin rays	
	XI	XII	XIII	18	19	20	21	22	23	24	10	11
British Guiana		3		1	1	1						2
Rio Negro-Amazon	1	8	1		3	1	2	1	1	2	2	10
Rio Negro (types of *leopoldi*)	4	20	2		7	14	5				2	24
Mouth of Amazon		3	1						4		1	3
Holotype of *dumerilii*		1							1			1

Localities	Anal fin rays											Oblique scale rows							
	VI	19	20	21	22	23	24	25	26	27	28	26	27	28	29	30	31	32	33
British Guiana	3		2	1										1	1				
Rio Negro-Amazon	10		2	2	2		1	3				1	2	2		3	1		1
Rio Negro (types of *leopoldi*)	26	1	8	11	5	1						1	3	9	8	4	1		
Mouth of Amazon	4						1		2		1					1	3		
Holotype of *dumerilii*	1						1									1			

P. altum (table 3); however, these differences are not great enough to enable me to identify all specimens on the basis of fin ray and scale counts, even if the dorsal and anal rays are added to the oblique scale rows to form a character index (table 4).

An examination of table 2, shows that the specimens of *P. dumerilii* collected near Belém, at the mouth of the Amazon have a slightly greater number of fin rays and scales than do specimens further up the Amazon—Río Negro systems.

The counts made on the holotype of *P. dumerilii* from Pará (now Belém) with XII,23 dorsal, VI,24 anal, 11 pectoral fin rays, and 30 scale rows along the side, fit into the higher end of the frequency distributions (table 2) for *P. dumerilii*; however, since the frequency distributions partly overlap for the various localities and the number of specimens are not sufficient to establish the extent of variability among populations, if such exist, I am recognizing only a single species, *P. dumerilii*.

P. dumerilii has been collected in the Amazon basin and in the Rupununi River of British Guiana (see open circles in map, pl. 1).

Pterophyllum altum Pellegrin

PLATE 3

Pterophyllum altum Pellegrin, 1903a, Bull. Mus. Hist. Nat. Paris, vol. 9, p. 125 [Rio Atabapo, Orinoco]; 1903b, Mem. Soc. Zool. France, vol. 16, p. 252, pl. 4, fig. 4 [Atabapo].—Regan, 1905, Ann. Mag. Nat. Hist., ser. 7, vol. 16, p. 442 [Rio Orinoco].—Eigenmann, 1910, Rep. Princeton Univ. Exped. Patagonia 1896–1899, vol. 3 (Zool.), pt. 4, p. 479 [Orinoco].—Ahl, 1928, Zool. Anz., vol. 76, p. 255 [Orinoco].—Schultz, 1949, Proc. U.S. Nat. Mus., vol. 99, p. 167 [Rio Atabapo]; 1953, Tropical Fish Hobbyist, vol. 1, no. 5, pp. 5–7, 20 [key to aquarium-bred angelfish].

Specimens studied (see page 2 for more precise locality): BMNH 1904–6–28–2–3, Rio Orinoco, 2 (59 and 60 mm); MNHN 221–61–1–3, Chaffanjon (Rio Atabapo), 5 syntypes of *P. altum* (42 to 62 mm); MNHN 221–61–1–1, Chaffanjon, 4 syntypes of *P. altum* (63 to 75 mm); MNHN 221–61–1–2, Chaffanjon, 5 syntypes of *P. altum* (59 to 65 mm); USNM 163204, Venezuela, 1 (79 mm); USNM 196007, Colombia, 1 (67 mm); CAS [no number], Rio Casiquiare, 1 (53 mm).

Pterophyllum altum Pellegrin has a color pattern identical with that of *P. scalare;* however, no black spot occurs on the upper midside as in *P. dumerilii.* The black bar through the eye curves dorsoposteriorly to the origin of the spiny dorsal and is not broken into three separate bars as in *P. dumerilii.*

This species is best recognized from *P. scalare* by the greater average number of median fin rays, oblique scale rows, and vertebrae (tables 1–4). Undoubtedly *P. altum* represents the *P. scalare* type of angelfish in the upper Orinoco, and in having a higher average number of dorsal, anal, oblique scale rows and vertebrae than *P. scalare,* it might be considered to represent only a subspecies of *P. scalare;* however, since *P. altum* has been taken so far only in the upper Orinoco basin, I prefer tentatively to recognize it as a distinct species.

Pterophyllum scalare (Lichtenstein)

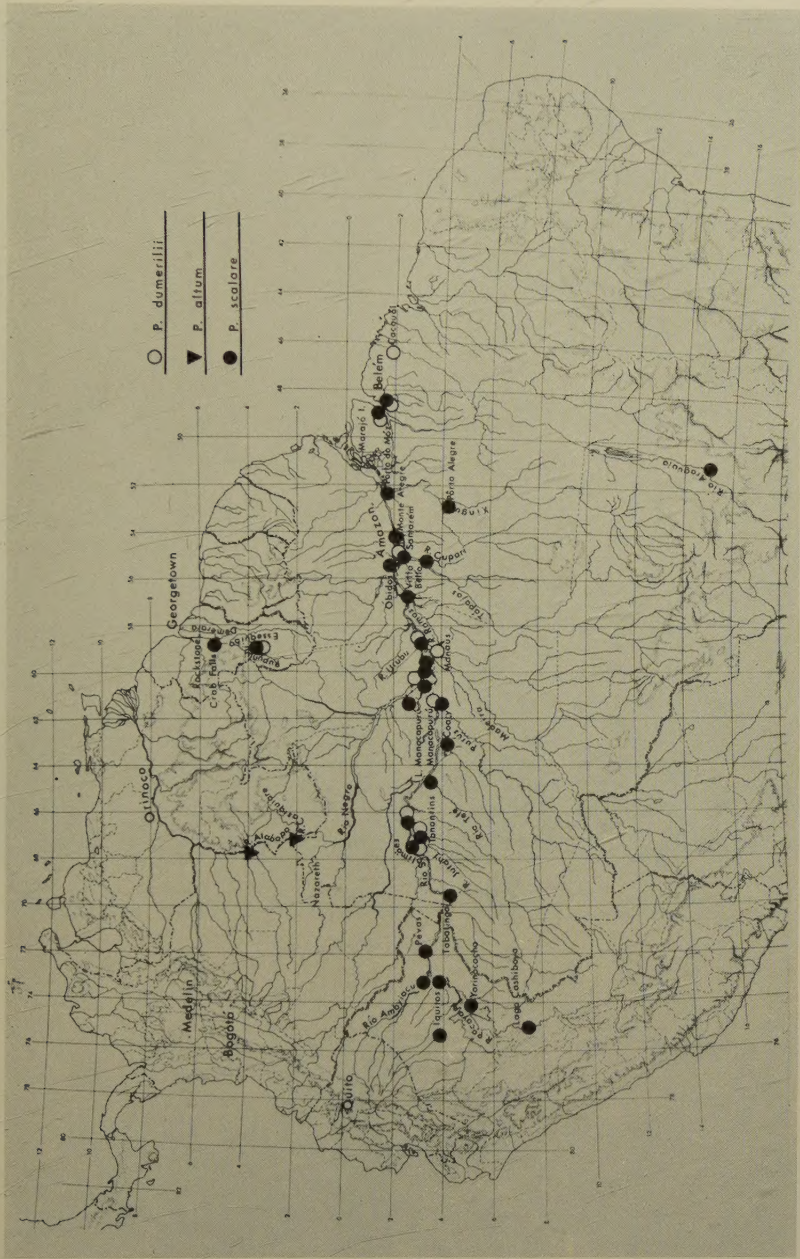
PLATE 4

Zeus scalaris Lichtenstein, 1823, Verz. Doubl. Zool. Univ. Berlin, p. 114 [Brazil].

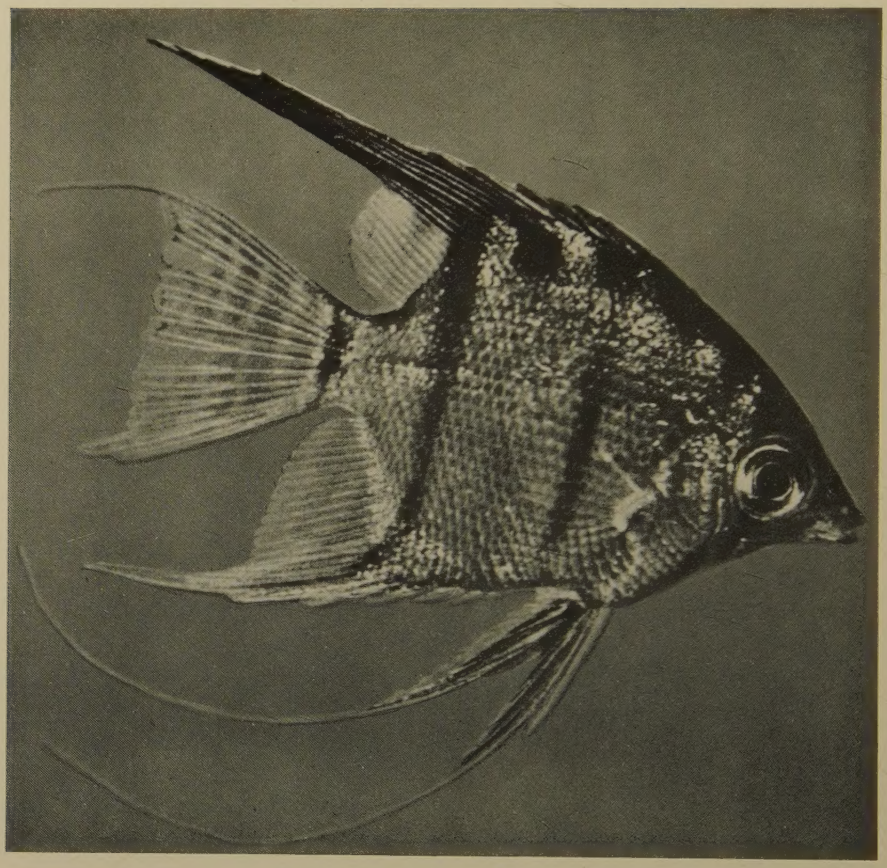
Platax scalaris Cuvier and Valenciennes, 1831, Histoire naturelle des poissons, vol. 7, p. 237 [Brazil, in "Collection de Bloch, au Musée de Berlin"].

Pterophyllum scalaris Heckel, 1840, Ann. Wien. Mus., vol. 2, p. 335, pl. 30, figs. 5, 6, 7–7a, 8–8b [Reo Negro].

Pterophyllum scalare Günther, 1862, Catalogue of the fishes in the British Museum, vol. 4, p. 316 [Rio Cupai; Brazil].—Kner, 1862, Sitz. Akad. Wiss. Wien., vol. 46, p. 295, pl. 1, figs. 1–1a.—Cope, 1872, Proc. Acad. Nat. Sci. Philadelphia, p. 250 [Rio Ambyiacu].—Steindachner, 1875, Sitz. Akad. Wiss. Wien., vol. 71, p. 76 [Amazon at Santarém, Monte Alegre, Villa Bella, Óbidos, Coary, Ueranduba, Tonantins, Tabatinga, Rio Jutahy, Xingu, Lago Manacapurú, Lago Maximo, Pará, Rio Ambyiacu; ?Barra do Rio Negro].—Eigenmann and Eigenmann, 1891, Proc. U.S. Nat. Mus., vol. 14, p. 71



Distributional map for species of *Pterophyllum*.



Pterophyllum dumerilii (Castelnau).

Pterophyllum altum Pellegrin.

Pterophyllum scalare (Lichenstein) (courtesy of T.F.H. Publications, Inc.).

[Amazon].—Eigenmann and Bray, 1894, Ann. New York Acad. Sci., vol. 7 p. 624.—Pellegrin, 1903, Mem. Soc. Zool. France, vol. 16, p. 251 [high Peru; upper Amazon, Tefé; Pará].—Regan, 1905a, Ann. Mag. Nat. Hist., ser. 7, vol. 16, p. 441 [Rio Cupai; Tabatinga; Manaus; Tonantins; Marajo Island in Rio Amazon]; 1905b, Proc. Zool. Soc. London, pt. 1, p. 190 [Rio Negro, Brazil].—Ihering, 1907, Rev. Mus. Paulista, vol. 7, p. 335 [Amazon at Tabatinga and tributaries].—Eigenmann, 1910, Rep. Princeton Univ. Exped. Patagonia, 1896–1899, vol. 3 (Zool.), pt. 4, p. 479 [Amazon].—Haseman, 1911, Ann. Carnegie Mus., vol. 7, p. 372 [Santarém, Manaus].—Eigenmann, 1912, Mem. Carnegie Mus., vol. 5, p. 521 [Rupununi River; Rockstone; Crab Falls].—Ribeiro, 1915, Arch. Mus. Nac. Rio de Janeiro, vol. 17, p. 56 [Amazon and tributaries].—Ahl, 1928, Zool. Anz., vol. 76, p. 254 [Amazon].—Eigenmann and Allen, 1942, Fishes of western South America, p. 406 [Iquitos, Yarinacocha].—Fowler, 1945, Los peces del Peru, Mus. Hist. Nat. Javier Prado, Univ. Nac. Mayor de San Marcos, p. 253, fig. 88 [Amazon, Peru].—Schultz, 1949, Proc. U.S. Nat. Mus., vol. 99, p. 167 [Venezuela]; 1953, Tropical Fish Hobbyist, vol. 1, pp. 5–7, 20 [key to aquarium-bred angelfish].

Pterophyllum eimekei Ahl, 1928, Zool. Anz., vol. 76, p. 252, fig. 1 [Rio Negro in the Amazon].

Specimens studied (see page 2 for more precise locality).—The following have USNM catalog numbers: 163210, probably British Guiana, 20 (28 to 63 mm); 198180, Belém, 5 (72 to 78 mm); 198179, Rio Purús, 4 (46 to 67 mm); 179565 and 179566, Rio Urubu, 54 (33 to 80 mm); 163210, probably lower Amazon, 6 (72 to 81 mm); 191591, upper Rio Araguaia, 1 (17.5 mm); 167754, Yarinacocha, 1 (54 mm); 167755, Iquitos, 2 (41 and 63 mm); 26664, Tabatinga, 1 (42 mm); 174942, British Guiana, 3 (71 to 81 mm); 175933, Pévas, 3 (27 to 31 mm). The following have BMNH numbers: 1926–3–3–3, Rio Negro, 1 (60 mm); 1925–10–28–452–457, Manacapurú, 6 (44 to 99 mm); 1926–10–27–488, Monte Alegre, 1 (50 mm); 53–3–19–42, Rio Cupai [probably Rio Cupari], 1 [not measured]; 81–5–13–129, Lago Cashiboya, 1 (43 mm); 85–1–14–71, Tabatinga, 1 (55 mm). The following have MNHN numbers: 221–61–2–1, Rio Negro, 1 syntype of *P. eimekei* (55 mm): 221–61–3–10, French Guiana, 3 (63 to 71 mm); 221–61–3–2, Tefé, 2 (90 and 101 mm); 221–61–3–3, Peru (Amazon), 5 (41 to 51 mm); 221–61–3–4, Peru (Amazon), 3 (50 to 82 mm); 221–61–3–5, Tefé, 5 (30 to 44 mm); 221–61–3–6, Caldron, 2 (65 and 79 mm); 221–61–3–9, Brazil, 3 (49 to 52 mm). The following have CAS numbers: [no number], Rio Negro, 4 (72 to 84 mm); [no number], Santarém, 11 (34 to 50 mm); IU 17780, Yarinacocha, 1 (47 mm); IU 2096, Tabatinga, 1 (43 mm); IU 5106, Lower Amazon, 1 (51 mm); IU 12502, Rupununi River, 1 (34 mm); IU 12504, Essequibo River, 2 (48 and 50 mm); IU 13368, Manaus, 1 (84 mm); [no number] "Pôrto Negro," 4 (46 to 61 mm); 5100, Marajó, 1 (57 mm); IU 12503, Essequibo River, 2 (43 and 44 mm); IU 15988, Iquitos, 4 (42 to 69 mm). The following have MCZ numbers: 14989, Coary, 4 (84 to

94 mm); 14993, Manacapurú, 2 (59 and 60 mm); 14984, Pôrto do Moz, 2 (47 and 51 mm); 14988, Tonantins, 3 (59 to 94 mm); 14997, Tabatinga, 2 (92 and 99 mm); 14985, Pôrto do Moz, 20 (37 to 48 mm); 14994, Santarém, 10 (46 to 54 mm); 14998, Óbidos, 4 (47 to 71 mm); 14991, Jutahy, 5 (43 to 73 mm); 14992, Jutahy, 3 (39 to 41 mm); 14987, Pôrto do Moz, 5 (40 to 44 mm); 14977 to 14980, Tefé, 10 (51 to 101 mm); 14977 to 14980, 14982 and 14983, Tefé, 6 (74 to 100 mm); 14996, Santarém, 3 (35 to 46 mm); 14990, Villa Bella, 6 (36 to 41 mm); 14999, Pará, 1 (54 mm); 14995, Santarém, 1 (44 mm); 14976, Monte Alegre, 6 (33 to 39 mm); 14981, Tefé, 10 (63 to 98 mm). The following have CNHM numbers: 15254, Santarém, 1 (38 mm); 54371, Manaus, 4 (81 to 90 mm); 54233, Manaus, 1 (49 mm); 53847, Essequibo River, 2 (41 and 43 mm); 54370, Santarém, 3 (40 to 56 mm); 53848, Essequibo River, 4 (44 to 47 mm); 15562, Peru, 1 (53 mm). The following have SU numbers: 36799, Pévas, 1 (62 mm); 36660, near Pévas, 1 (28 mm); 2205, Lower Amazon, 1 (59 mm); 36661, near Pévas, 2 (23 and 26 mm); 36797, near Pévas, 1 (37 mm); 54245, Santarém, 3 (45 to 57 mm); 60504, Pévas, 1 (75 mm); 36798, near Pévas, 3 (22 to 36 mm); 36659, near Pévas, 2 (37 and 46 mm); 36796, near Pevas, 3 (47 to 74 mm).

P. scalare (Lichtenstein) is the common angelfish of aquarists. Since 1928, when Ahl described *P. eimekei* from the mouth of the Rio Negro in the Amazon basin considerable confusion has occurred as to the validity of that species. *P. eimekei* was thought to average fewer dorsal and anal rays and fewer oblique rows of scales (Schultz, 1953) and as indicated by Ahl (1928) and Ladiges (1949, Deutsche Aquar. Terr., year 2, no. 3, pp. 50–52); however, most of their counts were based on aquarium specimens, undoubtedly inbred strains in aquaria, which most probably did not represent the species complex of natural populations found in the Amazon basin. The counts recorded in tables 3 and 4 are based on specimens from definite natural localities and not on aquarium-reared material.

The counts for the syntype of *P. eimekei* with XIII, 24 dorsal, VI, 26 anal, 10 pectoral fin rays, and 36 scale rows on the side fall nearly in the middle of the frequency distributions for Amazon specimens of *P. scalare* (tables 3 and 4). Thus, I conclude that *P. eimekei* is a synonym of *P. scalare*.

The differences between the color patterns of *P. scalare* and *P. dumerilii*, discussed under the latter species and shown in plates 1 and 3, should make identification easy; however, *P. scalare* and *P. altum* cannot be distinguished on the basis of coloration. The chief differences are the greater number of soft dorsal and soft anal fin rays and the number of scales in *P. altum* (tables 3 and 4). *P. altum* has 27 to 31 soft dorsal rays whereas *P. scalare* rarely has more than 26.

TABLE 3.—*Counts recorded for* Pterophyllum scalare *and* P. altum

Species and localities	Dorsal fin rays															Anal fin rays														
	XI	XII	XIII	XIV	21	22	23	24	25	26	27	28	29	30	31	V	VI	VII	22	23	24	25	26	27	28	29	30	31	32
altum																													
Upper Rio Orinoco	3	15	1								1	10	5	2	1		19								1	7	6	3	1
scalare																													
British Guiana	1	20	10		2	2	7	7	10	7						2	30	1	1	5	9	4	8	4	2				
Upper R. Araguaia		1						1									1			1									
Belém; Marajó I.	1	8	1					3	2	1	2	1	1				10				1		2	1	3	2	1		
Pôrto do Móz		17	10				4	13	8	2						2	25			1	6	10	7	1	2				
Santarém, Óbidos; Villa Bella; R. Cupari; Pôrto Negro; Monte Alegre		27	21		1	1	11	24	10	2		1					48			5	13	18	9	2	1				
Manaus; R. Urubu; R. Purus; Manacapurú; Coary		36	42					11	29	24	14	1				2	72	3			2	9	16	32	13	5	1		
Tefé		6	26		1			2	14	12	5						32					1	7	11	11	2			
Tonantins; R. Jutahy; R. Solimões; Tabatinga		9	7				1	5	5	5							16				4	4	5	2	1				
Peruvian Amazon		30	5				2	13	18	2							33	2		1	12	14	6	2					

Species and localities	Pectoral rays			Oblique scale rows																				
	10	11	12	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	
altum																								
Upper Rio Orinoco	1	20														5	4	2	1	1	3	1	2	
scalare																								
British Guiana	8	20		1	3	3	3	4	2	3	4	2	1	2	2	2								
Upper R. Araguaia, Belém, Marajó I.	1	7	6				3		2		1				1		1	2		1				
Pôrto do Móz		27			1	1	3	4	7	4	4	2	1											
Santarém Óbidos, Villa Bella; R. Cupari; Pôrto Negro; Monte Alegre	1	39	2		1	5	4	9	11	10	7	1	1	2										
Manaus; R. Urubu; R. Purus; Manacapurú; Coary	3	56	6				3	4	6	10	18	14	13	7	1		1	1						
Tefé	1	32					1	1	4	4	6	6	4	3	2	1								
Tonantins; R. Jutahy; R. Solimões; Tabatinga	1	14				1	2	5	2	1		3		2										
Peruvian Amazon	8	22				2	8	4	7	6	3	4	1											

Although proportional measurements were made on all three species of *Pterophyllum*, the great variability even at nearly equal sizes suggests that little reliance can be placed on measurements for identification purposes.

TABLE 4.—*Character index: Total number of rays in dorsal and anal fins added to number of scale rows for* Pterophyllum

Species and localities	83 84	85 86	87 88	89 90	91 92	93 94	95 96	97 98	99 100	101 102	103 104	105 106	107 108	109 110	111 112	113 114	115 116	117 118	119 120	121 122	123 124	125 126
altum																						
Upper Rio Orinoco																	3	5	4	4		
scalare																						
British Guiana				1	1	3	4	5	3	3	1	6	3	2								
Upper R. Araguaia									1													
Belém; Marajó I.								1	3		1				2	1	1	1				
Pôrto do Móz							1	5	2	5	2	1	1									
Santarém; Óbidos, Villa Bella; R. Cupari; Pôrto Negro; Monte Alegre						3	4	8	8	11	3			1	1							
Manaus; R. Urubu; R. Purus; Manacapurú; Coary									3	5	17	8	19	7		1	1					
Tefé								1		1	1	6	7	5	1							
Tonantins; R. Jutahy; R. Solimões; Tabatinga							1	3	2	6	1	1	1	1								
Peruvian Amazon							3	9	9	10	3	1										
dumerilii																						
British Guiana		1	2																			
Rio Negro-Amazon	2		3				2	1		1												
Rio Negro (type of *leopoldi*)	1	8	9	7	1																	
Mouth of Amazon, Cacaual		1					1		2													

An inspection of tables 3 and 4 indicates that for *P. scalare* there may be certain areas where distinct populations exist; the specimens from Pôrto do Moz, Santarém, Óbidos, for example, average fewer soft dorsal fin rays than specimens from Manaus, Rio Urubu, and Tefé. Specimens from British Guiana have about the same counts as those listed from Pôrto do Moz. Before any conclusion can be made for the "population" at the mouth of the Amazon, large series will need to be studied to find out the meaning of the bimodal nature of the frequency distribution for specimens from Belém and Marajó Island.

P. scalare ranges in the Amazon Basin and in the Rupununi and Essequibo Rivers of British Guiana with a single record from French Guiana (MNHN 221–61–3–10), the exact locality unknown. The known localities represented by specimens studied by me are recorded in plate 1.

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